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Patent Application

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CLIMBING CRANE

This invention relates to climbing crane having a tower, a boom, a hoisting cable for hoisting and lowering a load block, a hoisting gear for driving the hoisting cable and a climbing device having at least one climbing frame, which includes the tower and can be supported in a stationary position, for incremental hoisting of the tower.

With known climbing cranes of this type, the climbing device has a hydraulic hoisting gear, which is suspended with its base in climbing guides arranged at the side of the base of the tower, hoisting the tower by means of a hoisting ram. Such a hydraulic hoisting gear is expensive, difficult to operate and requires its own drive.

The object of this invention is to simplify the design of a climbing crane of the type defined in the preamble with regard to the climbing device. This object is achieved according to this invention by the fact that the climbing device has a climbing cable, which is connected between the tower and the climbing frame and can be connected to the hoisting gear, so that the tower can be hoisted by means of the hoisting gear in climbing with the load block secured.

This invention is thus based on the general idea of using the load hoisting gear for hoisting the tower in climbing. The load hoisting gear, which is present anyway, thus has a new function. Therefore, this eliminates the need for a separate climbing drive, in particular the hydraulic hoisting device of the known climbing devices. This makes the climbing crane less expensive to manufacture in particular as well as making it easier and simpler to operate.

A climbing block which can be locked onto the tower in load operation of the crane and can be released from the tower for climbing is expediently suspended on the hoisting cable with the climbing cable attached to it. Therefore, two strands of the hoisting cable are effective in hoisting the weight of the crane in climbing of the crane as well as in hoisting a load by means of a load block suspended on two strands of the hoisting cable. Furthermore, no change in the cable guidance is necessary in switching from load operation to climbing and vice versa. The climbing load need only be released from the tower or locked to it.

The climbing cable is expediently rigged like a block and pulley between the tower and the climbing frame. The block and pulley must be designed so that, first of all, the power of the hoisting gear is sufficient to hoist the crane, and secondly, the particular climbing path can be accomplished with the available length of the hoisting cable.

In the case of a crane having a crane trolley, which can traverse the boom and over which the hoisting cable of the load block is guided, another embodiment of this invention provides for the load block to be detachably secured on the crane trolley. In this case, in which the load block is suspended on two strands of the hoisting cable, the load block must be secured in the transition from load operation to crane climbing. In a particularly simple embodiment, this is possible by securing the load block on the crane trolley.

In order not to have to hoist the climbing frame manually by one stage after each climbing step, it is advantageously possible to provide for a frame adjusting cable to be attached to the climbing frame, so that this cable can be suspended from the climbing load for hoisting the climbing frame. Therefore, the climbing frame can also be hoisted incrementally in synchronization with the climbing with the help of the hoisting gear in this design. The same thing is also possible in

hoisting guide frames.

Additional details and advantages of this invention are derived from the following description of one exemplary embodiment in combination with the drawing, which shows:

Figure 1 an inventive climbing frame in a schematic side view in a building shaft;

Figure 2 a partial diagram of the crane according to Figure 1 in the area of the detail II;

Figure 3 a partial diagram of the crane according to Figure 1 in the area of the detail III;

Figure 4 a schematic diagram of the climbing cable guide of the crane according to Figure 1; and

Figure 5 a partial diagram of the crane according to Figure 1 in the area of detail V.

The climbing crane shown in the drawing has a tower 1 composed of tower sections 1a, 1b, 1c and 1d as well as a tower pinnacle 1f. The tower 1 stands in a shaft 2, e.g., a hoisting shaft of a building that is to be erected with its help having floors 3 with floor projections 3a protruding into the building shaft 2. A boom 4 is connected to the crane tower 1 and is held in a horizontal position by an anchoring cable 5. A counter boom 6 is mounted in an articulated connection on the rear side of the tower, so that it is aligned with the boom 4 and is held in a horizontal position by means of a holding cable 7, carrying a counter weight 8 on its outer end. The boom 4 and the counter boom 6 are rotatably mounted on the tower 1 by means of a rotating connection 9 and can be rotated about it by a rotating drive (not shown). Thus this is a so-called top slewing crane.

A crane trolley 10 can travel along the bottom boom of the jib or cantilever arm 4. This trolley is moved by means of a trolley drive gear 11 with the help of a trolley cable (indicated with dash-dot lines at 12).

A load hoisting cable 14 coming from a load hoisting gear 13 on the counter boom 6 is guided over a pair of pulleys 15 at the pinnacle 1f of the tower, another pulley 16 which is at the level of

the boom 4 in the lower area of the pinnacle 1f of the tower, a guide pulley 17 on the boom, a pulley (not shown) on the outer end of the boom and a pair of pulleys 18 on the crane trolley 10 leading to a fixed point 19 on the tower 1.

A climbing block 20 is suspended on the load hoisting cable 14 between the pulleys 15 at the pinnacle 1f of the tower. This climbing block 20 may be detachably mounted on a cross strut 21 of the tip of the tower 1f, e.g., by means of a socket pin connection 22.

A conventional load block 23 is suspended on the load hoisting cable 14 between the pulleys 18 on the crane trolley 10. The load block 23 may be detachably connected to a strut 24 of the crane trolley 10, e.g., by means of a socket pin connection 25, as indicated with dotted lines in Figure 1 and with solid lines at 23' in Figure 3.

The tower 1 is surrounded by a climbing frame 26 which rests on the floor projections 3a and has laterally protruding supporting arms 27 (Figure 5) which can be telescoped into sections of the climbing frame 26. The climbing frame 26 is secured to prevent lateral displacement by screw-on supporting legs 28 which are supported on the end faces of the floor projections 3a. Guide elements (not shown), e.g., crossed guide rolls are arranged at the four inside corners of the climbing frame 26 and act on the corner belts of the tower 1 to provide guidance. In the area of the climbing frame corners, supporting flaps 29 are mounted so they can pivot about axial pins 30 on the top side of the frame. Each supporting flap 29 is provided with a recess 29a (Figure 5) into which a supporting pin 30 can be inserted. Such supporting pins 30 are attached in two pairs on the lower end of each of the tower sections 1a-c.

Beneath the climbing frame 26, a guide frame 31 is supported on the floor projections 3a and is secured against lateral displacement by supporting feet 32. The guide frame 31, like the climbing frame 26, includes guide elements (not shown), e.g., crossed guide rolls, which guide the corner flange of the tower 1 in climbing. Other guide frames may also be provided above and below the guide frame 31 if necessary for secure guidance of the tower 1 in climbing. The guide frame 31 has supporting flaps 33, which are also pivotable and correspond to the supporting flaps 29 and on which the supporting pins 30 can be supported.

A climbing cable 34 shown with a dash-dot line in Figures 1 and 4 is rigged like a double-purchase pulley between the climbing frame 26 and the base of the bottom tower section 1d. To this end, the climbing frame 26 has a number of pulleys and idler pulleys 35, while corresponding pulleys 36 are mounted at the base of the bottom tower section 1d. In the exemplary embodiment shown here, the cable rigging used between the climbing frame 26 and the base of the tower section 1d is diagrammed schematically in Figure 4. The climbing cable 34 is attached at one end at 37 to a fixed point on the climbing frame 26. The other end of the cable may be suspended from the climbing block 20.

Finally, a frame adjusting cable 38 may be suspended in the manner illustrated in Figure 1 from the climbing frame 26 or the guide frame 31. This frame adjusting cable is guided over pulleys 39 on the side of the top tower section 1a and over additional pulleys 40 situated further towards the interior and can also be suspended on the climbing block 20 between the pulleys 40.

The crane described here is operated at follows:

To be able to transport loads with the crane, the climbing block 20 is secured on the strut 21 of the tower pinnacle 1f by means of the socket-pin connection 22. The cable pulley 22a of the climbing block 20 then acts as a simple pulley for the load hoisting cable 14. The load block 23 is released by the crane trolley 10 and hangs in the position on the load hoisting cable 14 shown with solid lines in Figure 1. A load can be picked up with the load block 23 and raised and lowered by the load hoisting gear 13 as well as being transported horizontally by moving the crane trolley 10 along the boom 4.

If the crane is supposed to climb upward as the height of the building increases, then first the load block 23 is brought into the position labeled as 23' in Figures 1 and 3, where it is secured on the crane trolley 10. Then its cable pulley 23a acts like a simple pulley for the hoisting cable 14.

Then the climbing block 20 is released from the strut 21 so that its cable pulley 20a is suspended in a double strand of the hoisting cable 14. Then the hoisting cable is released by means of the hoisting gear 13 until it assumes the position 14' in Figure 1. Then the climbing load is in the same position labeled as 20' in Figure 1. In this position, the climbing cable 34 can be suspended

on the climbing block.

If the hoisting cable 14 is retracted in the direction of arrow P_1, then the block and pulley completes the circle between the pulleys 35 and 36. The pulleys 36 rise upward and entrain the tower 1 in the direction of arrow P_2. With this movement of the tower 1, the supporting pins 30 are hoisted up from the supporting flaps 29 and 33. When the hoisting path of the tower 1 reaches the height of a tower section, then the supporting pins 30 of the next following tower section in the hoisting movement are in contact with the supporting flaps 29 and 33 from beneath and entrain them upward by pivoting them about their axle ends. As soon as the supporting flaps are released from the supporting pins, the supporting flaps are pivoted downward again into the position shown here. By slightly easing off on the hoisting cable 14, the tower is then supported again on the supporting flaps with the corresponding supporting pins.

After hoisting the crane, to transport the climbing frame and the guide frame upward by one floor level, first the supporting arms 27 of the climbing frame 26 are telescoped into the frame. This is expediently done while relieving the supporting arms 27 by slightly hoisting the tower by means of the hoisting gear 13. Previously the frame adjusting cable 38 has been suspended on the climbing frame 26 and on the climbing block which is stationary in position 20". The load hoisting cable here is in position 14" shown in Figure 1. By slightly easing off on the load hoisting cable, the supporting flaps 29 can then be released from the supporting pins 30. The crane then rests with the supporting pins 30 of the tower section 1c on the supporting flaps 33 of the guide frame 31. It may also be supported on additional guide frames (not shown here). After the supporting flaps 29 of the climbing frame 26 have been pivoted upward, by hoisting the climbing block out of the position 20' in the direction of arrow P_3 the climbing frame 26 can be hoisted up by one floor by means of the frame adjusting cable 38 in the direction of arrow P_4. During the hoisting movement, the supporting flaps 29 are pivoted back into the position shown here. At the end of the hoisting movement, the recesses 29a in the supporting flaps are thus in contact from beneath with the supporting flaps 30 of the tower section 1d which was hoisted up previously. Then the supporting arms 27 can be run out again and the climbing frame thereby supported on the projections 3a of the next higher floor.

Then the guide frame 31 is hoisted by one floor in a similar manner.

Of course before suspending the frame adjusting cable 38, the climbing cable 34 has been released from the climbing block 20 and secured on the tower in any desired manner. After hoisting the guide frame 31, the frame adjusting cable 38 is also suspended and the climbing block is again secured at the pinnacle of the tower.

The crane can then be used again for transport of loads.

This invention is not limited to the exemplary embodiment illustrated here. In other words, the crane can also combine in the manner described here when new tower sections are pushed downward after being hoisted up. In this case it is expedient to combine the pulleys 36 on one climbing beam which can be detachably supported in the upward direction at the lower end of a tower section, e.g., it can be applied against the supporting pins 30. This climbing beam must then be released after the conclusion of the climbing step and set at the base of the newly added tower section. In this case the frames 26 and 31 need not necessarily be hoisted incrementally. However, then other guide frames are of course also necessary.

It is then of course also possible to rig the climbing cable 34 in other ways. It is essential only that the capacity of the hoisting gear 13 and the adjustment pathway of the hoisting cable 14 must be sufficient to hoist the crane up by the height of one tower section. The hoisting cable may of course also be attached suitably at its free end for climbing on the crane tower. If the crane tower is lengthened by adding tower sections, then it is expedient to wind the endpoint of the climbing cable 34 at 37 onto a cable drum because in this case a climbing cable that becomes longer is necessary as the tower increases in size.

PH 3370 **Patent Claims** 26 Aug 1970

1. A climbing crane comprising a tower, a boom, a hoisting cable for hoisting and lower a load block, a hoisting gear for driving the hoisting cable and a climbing device comprising at least the tower and having climbing frames supportable in a stationary position for incrementally hoisting the tower, characterized in that the climbing device has a climbing cable (34) which is rigged between the tower (1) and the climbing frame (26) and can be coupled to the hoisting gear (13), so that the tower can be hoisted by means of the hoisting gear in climbing with the load block (23) secured.

2. The climbing crane according to Claim 1, characterized in that a climbing block (20), which can be locked on the tower (1) in load operation of the crane and can be released from the tower for climbing is suspended on the hoisting cable (14) with the climbing cable (34) suspended on the block.

3. The climbing crane according to at least one of Claims 1 and 2, characterized in that the climbing cable (34) is rigged like a block and pulley between the tower (1) and the climbing frame (26).

4. The climbing crane according to at least one of Claims 1 through 3, comprising a crane trolley which can be moved along the boom and by means of which the hoisting cable is guided to the load block, characterized in that the load block (23) is releasably detachable to the crane trolley (10).

5. The climbing crane according to at least one of Claims 1 through 4, characterized in that the climbing cable (34) runs from the climbing block (20) over at least one pulley (35 or 36) at the base of a tower section (1d) and on the climbing frame (26) to a stationary point (37) or a storage drum on the climbing frame.

6. [omitted in source doc]

7. The climbing crane according to at least one of Claims 1 through 6, characterized in that a

frame adjusting cable (38) is provided and can be suspended from the climbing block (20) and can be attached to the respective frame for hoisting the climbing frame (26) or a guide frame (31).

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[see source for Fig. 2, 3, 4, and 5]

[see source for Fig. 1]